

REMARKS/ARGUMENTS

Claims 51-185 are pending. Claims 60, 84, 119, 126, 142, 151, 160, and 169 have been rewritten in independent form. Claims 135, 152 and 170 have been amended only to correct typographical errors.

I. Double Patenting Rejection

In response to the obviousness-type double patenting rejections, Applicants are obtaining a new Power of Attorney, which will address the Examiner's concerns regarding the Terminal Disclaimer.

II. Claims Rejections Under § 103

Claims 51-59, 74-83, 100-101, 112-118, 120, 123-125, 135-141, 143-150, 152-159, and 161-168 stand rejected as being made obvious by Fujikawa et al. (U.S. 5,520,744).

Claims 51-59, 74-83, 100-101, 135-141, and 143-150

Claim 51 includes the steps of, “performing a quick dump to discharge the process fluid from the vessel, leaving residual process fluid on the surface of the object,” and “after discharging the process fluid from the vessel, introducing a drying vapor into the system.” Claims 52-59 are dependent on Claim 51 and also include these steps.

Claim 74 includes the steps of “performing a quick dump to discharge the rinse fluid from the vessel, leaving residual rinse fluid on the surface of the object,” and “after discharging the rinse fluid from the vessel, introducing a drying vapor into the vessel.” Claims 75 – 83 are dependent on Claim 74.

Claim 100 includes the steps of “discharging the rinse fluid from the vessel, leaving residual rinse fluid on the surface of the object,” and “after discharging the rinse fluid from the vessel, introducing a drying vapor into the vessel.” Claim 101 is dependent on Claim 100.

Claim 135 recites the steps of “discharging the process fluid from the vessel” and “after discharging the process fluid from the vessel to expose the surface, introducing a drying vapor into the vessel.” Claims 136-141 are dependent on Claim 135.

Claim 143 recites the steps of “discharging the rinse fluid from the vessel” and “after discharging the rinse fluid from the vessel to expose the surface, introducing a drying vapor into the vessel.” Claims 144-150 are dependent on Claim 143.

Claims 51-59, 74-83, 100-101, 135-141, and 143-150 are not made obvious by Fujikawa et al., since the Fujikawa reference lacks any teaching of introducing a drying vapor into the vessel after discharging the process fluid from the vessel. Instead, Fujikawa describes that the alcohol is supplied to the surroundings of the wafer in the step of discharging the deionized water. Applicants have found that introducing the drying vapor after discharging the process fluid to a level beneath the elevation of the substrate aids in the removal of particles from the substrate’s surfaces. As the process fluid or rinse fluid descends within the process vessel, there is a meniscus of fluid extending between the substrate and the receding bulk fluid. Shear forces from the receding fluid aid in removing particles from the surface of the substrate. If drying vapor is introduced before the receding fluid level drops below the substrate (as in Fujikawa), the drying vapor can reduce the surface tension of the descending meniscus of water, thereby disrupting the meniscus and reducing the shear forces.

Applicants also wish to point out that Fujikawa lacks any teaching of (prior to the introducing step) performing a quick dump to remove the process/rinse fluid from the vessel, as is recited in Claims 51, 74 and their respective dependent claims. As discussed in Applicants’ specification, the quick dump helps to strip water and particles from the substrates. Thus, Claims 51-59 and 74-83 are further patentable for this reason.

Claims 112-118, 120, and 123-125

Claim 112 includes the steps of “discharging the treatment solution from the vessel,” and “after the treatment solution has been fully discharged from the vessel and without first rinsing the semiconductor substrate, introducing a drying vapor into the vessel.” Claims 113 – 118 are dependent on Claim 112.

Claim 120 recites the steps of: “discharging the treatment solution from the vessel;” and “after the treatment solution has been fully discharged from the vessel and without first rinsing the object, introducing a drying vapor into the vessel.” Claims 123-125 are dependent on Claim 120.

Claims 112-118, 120, and 123-125 are not made obvious by Fujikawa et al. for reasons similar to those set forth above. In particular, the Fujikawa reference lacks any teaching of introducing a drying vapor into the vessel after discharging the rinse fluid from the vessel.

Claims 152-159 and 161-168

Claim 152 recites the steps of “discharging the process fluid from the vessel so as to drop the liquid level of the process fluid to an elevation beneath the elevation of the surface” and “after discharging the process fluid . . . introducing a drying vapor into the vessel.” Claims 153-159 are dependent on Claim 152.

Claim 161 recites the steps of “discharging the rinse fluid from the vessel so as to drop the liquid level of the rinse fluid to an elevation beneath the elevation of the surface” and “after discharging the rinse fluid . . . introducing a drying vapor into the vessel.” Claims 162-168 are dependent on Claim 161.

Claims 152-159 and 161-168 are not made obvious by Fujikawa et al. for reasons similar to those set forth above. In particular, the Fujikawa fails to teach the recited steps of “discharging the process fluid from the vessel so as to drop the liquid level of the process fluid to an elevation beneath the elevation of the surface” and “***after discharging the process fluid . . .*** introducing a drying vapor into the vessel.”

III. Claims Rejections Under § 102

Claims 51, 56, 61-63, 68 and 112 stand rejected as being anticipated by Takase et al. (U.S. 6,152,153).

Applicants respectfully submit that the Takase reference does not qualify as prior art against the present application. The § 102(e) date for the Takase reference is December 7, 1998, which is after the filing of the provisional application to which the present application claims priority. For this reason, the Takase reference is not prior art. For this reason, Applicants will not address the substance of the rejection based on Takase.

IV. Claims Not Subject to Rejections Based on Prior Art

Applicants note with appreciation that Claims 60, 64-67, 69-73, 84-99, 102-111, 119, 121-122, 126, 127-134, 142, 151, 160, 169 and 170-185 have not been rejected based on prior

art. Claims 60, 84, 119, 126, 142, 151, 160, and 169 have now been re-written in independent form. Given that the double patenting rejection is overcome by the Terminal Disclaimer, and given that these claims are free from any prior art rejection, allowance of Claims 60, 64-67, 69-73, 84-99, 102-111, 119, 121-122, 126, 127-134, 142, 151, 160, 169 and 170-185 is respectfully requested.

Moreover, in view of the lack of availability of the Takase reference against Applicants' claims, Claims 61-63 and 68 are likewise free from prior art rejections. Their allowance is also respectfully requested.

V. Conclusion

In view of the forgoing, it is respectfully submitted that all claims are allowable over the cited references. Early reconsideration and allowance of the claims is respectfully requested.

Respectfully submitted,

STALLMAN & POLLOCK LLP

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By: Kathleen A. Frost

Kathleen A. Frost
Reg. No. 37,326

Attorneys for Applicant(s)